SECTION 2
PROPOSED PROJECT AND ALTERNATIVES

This section begins with an overview of the proposed project, followed by a discussion of the development of alternatives to address sediment in Bolinas Lagoon and a discussion of the alternatives. At this time, the lead agencies do not have a preferred alternative. A summary of applicable state and federal laws is presented at the end of this section.

2.1 PROPOSED PROJECT OVERVIEW

The proposed project would address 150 years of sediment build up in Bolinas Lagoon by removing approximately 1.4 million cy of sediment from the lagoon and approximately 200,000 cy of dry soil from upland areas adjacent to the lagoon. This sediment-removal project would require the use of hydraulic suction dredges and other heavy equipment and would take approximately nine years to complete.

Sensitive species activity in the lagoon would limit dredging and upland excavation activities to a narrow window in late summer and early autumn of no more than three months per year. Sediment removed from the floor of the lagoon would be taken to a disposal site west of the Farallon Islands by barge, while upland soil and vegetation removed from Kent Island, Pine Gulch Creek Delta, Dipsea Road, and elsewhere would be taken to Redwood Landfill by barge and truck.

2.2 DEVELOPMENT OF ALTERNATIVES

An extensive discussion of the development of the project alternatives is available in the FS, sections 4, 5, and 6. In order to develop a list of alternatives that would satisfy the habitat restoration goals of the project, while avoiding adverse impacts to biological resources, the lead agencies convened a HEEP, consisting of biologists and other scientists familiar with Bolinas Lagoon. In consultation with MCOSD, BLTAC, the HEEP and the Corps have created a target structure for the lagoon, based on historic lagoon hydrology, in order to establish improved levels of tidal exchange and ecological health. The Corps has developed two dredging alternatives, has examined sediment issues in the watershed, and has conducted hydrologic modeling to ensure that maintenance dredging would not be necessary after the sediment removal project is completed.

Development of the project alternatives has been constrained by the following factors:

- The presence of sensitive species in the lagoon and surrounding watershed, including marine mammals, anadromous fish, and waterfowl, and the timing of critical events in their life cycles;
- The complex hydrology of the lagoon, including hydraulic relationships between tidal prism and inlet geometry, channel length and flushing time, and channel cross-sectional geometry and velocity;
- The limited long-term historical information on the lagoon's frequently changing hydrology and bathymetry;
- The need to monitor for adaptive management of the project as this long-term program is implemented;
- The complex variables influencing sedimentation in the lagoon, including slope and soil composition in the watershed, weather conditions, land use history, and other unpredictable factors, such as seismic events;
- The feasibility and cost of removing large quantities of sediment from the lagoon;
- The Corps' policy prohibiting enhancement of human environments;
- The availability and cost of appropriate disposal sites for material removed from the lagoon (as discussed extensively in Section 4.8 of the FS); and
- The existence of extensive residential development on the shore of the lagoon in the Seadrift area of Stinson Beach.

Project alternatives consist of removing sediment from the floor of the lagoon, opening channels within the lagoon to enhance tidal flow, removing soil from areas that have been previously filled by human activity (upland fills), and depositing the material in locations outside the Bolinas Lagoon watershed.

Scoping began on the Bolinas Lagoon Ecosystem Restoration Project in 1998. Since that time, regular meetings among the Corps, MCOSD, BLTAC, and the local communities have helped the lead agencies develop a series of alternatives to be considered for feasibility, environmental impact, and effectiveness. The Corps and MCOSD have sponsored several community meetings and public workshops in Stinson Beach and Bolinas to keep the general public informed of the progress of the restoration project. They also have sent out newsletters to keep the public apprised of key project milestones.

In order to develop scientifically sound proposals to address sedimentation in the lagoon, the Corps convened a series of HEEP meetings beginning in August 2000. In these meetings, which were open to the public, scientific experts on the biology, geology, and hydrology of Bolinas Lagoon and the surrounding watershed considered the Corps' proposals for the lagoon. On advice from the HEEP, the lead agencies established a short list of alternatives in March 2001. Members of the HEEP or BLTAC will continue to meet to advise on adaptive management techniques for implementing the project.

A screening analysis was conducted to determine the practical, environmental, and regulatory feasibility of the alternative restoration concepts. The purpose of the screening was to eliminate alternatives that either did not meet the project purpose and need or that clearly were not feasible from a cost, technical, or environmental standpoint. An alternative was eliminated from further analysis under any of the following:

- It did not meet the project purpose and need;
- It was not feasible from a technical perspective;
- It had clearly unacceptable environmental impacts; or
- It was determined to not be cost effective because it returned too little environmental benefit at only a slightly reduced cost.

Further discussion of cost effectiveness as an element of project feasibility is provided in sections 4 and 5 of the FS.

Based on this screening, as discussed in the FS, two sediment removal alternatives have been carried forward for detailed analysis. As required by NEPA and CEQA, the no project/no action alternative is also analyzed in detail. The two project alternatives each involve removing sediment from Bolinas Lagoon and disposing of the material at one of two locations; the San Francisco Deep Ocean Disposal Site (SFDODS) for ocean disposal and the Redwood Landfill for upland disposal. Other disposal sites were eliminated based on one or more of the screening criteria.

2.3 Project Alternatives

The alternatives consist of two project alternatives, which would both remove over 1,400,000 cy of wet sediment and upland fill from selected areas throughout the lagoon, and the No Action Alternative. Aspects of the project alternatives that have yet to be fully developed include construction planning, scheduling sediment removal and identifying specific adaptive management techniques to evaluate and respond to changes in the lagoon ecosystem and hydrology as a result of project activity.

The two project alternatives vary only with regard to excavation in Pine Gulch Creek Delta (PGC Delta) and the total amount of sediment and vegetation to be removed from the project area. Schedules have yet to be finally determined, but uses of the lagoon by wildlife may limit construction to only a few months in the summer and fall. The two project alternatives are known as the Riparian Alternative and the Estuarine Alternative. The Riparian Alternative is identified as the locally preferred plan (LPP), and the Estuarine Alternative is identified in the Bolinas Feasibility Study (FS) as the National Ecosystem Restoration plan (NER).

2.3.1 Riparian Alternative (LPP)

This alternative would involve removing 1.4 million cy of wet sediment from the lagoon and dry soil and vegetation from the adjacent upland. Locations all over the lagoon would be dredged, and dry land adjacent to the lagoon also would be excavated. In some areas vegetation, including mature trees and shrubs, would be removed. Full construction is estimated to take three to four months per year for nine years; the short construction periods are designed to limit impacts on sensitive species in the lagoon. Construction schedules have not yet been developed, but, for the purposes of this EIS/EIR, construction is estimated to require approximately 60 working days per year, including 33 days of round-the-clock dredging.

Excavation and Disposal Overview

Wet Sediment Excavation

Wet sediment would be removed from the lagoon floor by a cutterhead suction dredge (Figure 2-1), which would remove sediment in a liquid slurry from the floor of the lagoon, while upland soils would be removed by land-based excavators. At this stage of the planning process, it is assumed that only one dredge would be used at a time in order to reduce short-term impacts on sensitive habitats.

Locations where dredging and upland excavation would take place are identified in Figure 2-2; specific dredging and excavation locations are discussed in more detail later in this section. Dredging activities would be staged from Winnebago Point, on the northeast side of the lagoon, and equipment would be stored there for the duration of the project.

The dredge being considered for use in this project is a floating dredge that can be transformed into an amphibious dredge by bolting on tires. This allows the dredge to traverse land and shallow areas normally not accessible to conventional dredges. In addition, this particular dredge has optional work implements, whereby vegetation harvesting, raking, and solid material grappling is possible, when required. When floating, the dredge would be moved by being poled forward on walking spuds, by winching along anchor wires, or by using a propulsion system, such as an outboard motor. The dredge head is on an articulated pipe extending from the front dredge and can be manipulated by the dredge operator. This articulated head gives the dredge a considerable range and reduces the need to relocate the dredge frequently. A disposal pipeline eight inches in diameter extends from the rear of the dredge.

2-1 Cutterhead Suction Dredge

2-2 Riparian Alternative Excavation Sites

The dredge head has sharp teeth designed to chew through packed sand and clay. As the dredge head spins, the dredge pump sucks in the dislodged sediment through the dredge head, along with a large amount of water, to form a slurry. Because the slurry would be pumped some distance prior to disposal, the sediment would be mixed with sufficient water to form a ratio of 25 percent sediment to 75 percent water. A suction dredge pulls disturbed water and soil into the pipe, so noticeable water quality impacts should not result from disturbing the sediment. The dredge being considered for use in this project has not been identified yet, but would probably have a dredgehead diameter of 8 inches, would have a maximum capacity of 200 cy per hour of sediment, and would be used 24 hours per day, seven days per week. The dredge would be powered by either electrical current from the shore of the lagoon or by a diesel engine muffled to reduce noise emissions. The size of the engine would vary, depending on the size of the dredge. Lights mounted on the dredge itself would provide illumination for night-time dredging.

The slurry would be pumped from the dredge through a flexible pipeline over the end of Stinson Beach sand spit to one of two transport barges, or scows, anchored in Bolinas Bay (Figure 2-3). The pipe would be eight inches in diameter, would be up to 16,300 feet long, would be made of steel or polyvinyl chloride (PVC), and would be kept afloat in the lagoon by buoys. Where it crosses the sandspit and the beach, the pipeline would be protected from interference by fences and flags. A walkway would be built to enable passersby to cross the pipeline, either by running the pipe underground at that point or by building a bridge over it. For most of the upland crossing, the pipeline would rest on top of the beach sands but may be covered by blowing sand as the season progresses. From the beach to the disposal scow the pipeline would run along the bottom of the bay. If steel, the pipeline would be green or rust-colored; if PVC, it would be black. The pipeline would be designed to keep up with the capacity of the dredge as it excavates, so there would be no backlog of dredged material waiting to be pumped out to the scow. The pipeline would be removed after the end of each dredging season and would be reinstalled the following summer.

Disposal of Wet Sediment

The scow would be anchored to a floating dock past the surf zone. The slurry would not be drained from the scow and would be transported as is to the disposal site. The disposal scows are presumed to operate 24 hours per day, seven days per week. Once filled with slurry, each scow would be towed by a tugboat to the SFDODS, which is roughly 55 miles away, west of the Farallon Islands. The scows are assumed to have a capacity of 3,000 cy and would be towed at seven knots to the disposal site (unloaded velocity is roughly eight knots).

Figure 2-4 provides the locations of the proposed disposal sites. Because the environmental impacts of the use of these sites for dredged material disposal have been addressed in previous NEPA or CEQA documents, this EIS/EIR addresses only the environmental impacts of the sediment removal in Bolinas Lagoon and the transport of

2-3 Pipeline From Dredge to Barge

2-4 Disposal Site Locations

the sediment to the disposal sites. Disposal at the SFDODS requires that dredged material be tested for metals, polynuclear aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), pesticides, and other contaminants before disposal is approved. This could affect cost or use of this disposal site for particular sediments if any contaminants were discovered.

Excavation and Disposal of Dry Upland Material

Upland sites would be excavated with land-based excavating machinery, such as bulldozers, loaders, and cranes. The removed materials would be dry and therefore would be transported by dump trucks rather than by barge. Each truck is assumed to have a capacity of 12 cubic yards. The disposal location for dry soil is the Redwood Landfill in Novato, California. Vegetation removed from some upland sites would also be disposed of at Redwood Landfill, unless the material could be sold or recycled.

Excavation Locations

Sediment removal in the lagoon under this alternative would reopen old channels or create new ones to increase hydraulic exchange within the lagoon. Earlier in this study, these channels were designed with a vertical rise of one foot for each three feet of horizontal distance (or 1V:3H) for the channel sides; however later analysis has determined that a ratio of 1V:4H would be a more stable slope. Hydrological effects are expected to change channel slopes rapidly to such an extent that the difference between 1V:3H and 1V:4H should be unnoticeable within a matter of months. As a result, the project designers have opted to retain the 1V:3H ratio for calculating results, while actual excavation would be done to a ratio of 1V:4H for channel sides.

Figure 2-2 shows the location of excavation activities under the Riparian Alternative, under which dredging would take place in the lagoon in the North Basin, Main Channel, Kent Island, Bolinas Channel, Pine Gulch Creek Delta (PGC Delta), and South Lagoon Channel. Additionally, dry land excavation would take place at Dipsea Road, the Highway 1 Fills, and Pine Gulch Creek Delta.

The primary staging area for the Riparian Alternative would be Winnebago Point, on Highway 1 in the northeast quarter of the lagoon. Excavation in PGC Delta would be staged from the MCOSD property adjacent to PGC Delta, off Olema-Bolinas Road.

Table 2-1 provides an overview of project elements, including excavation volumes and footprints, expected construction periods, and numbers of barge- or truck-loads necessary to dispose of excavated materials. Section 4 of the FS provides an extensive discussion regarding the development of these project elements.

North Basin and Main Channel

The North Basin and Main Channel elements were developed as a way to improve tidal prism in the lagoon quickly by dredging the basin that had historically existed at the north end of the lagoon and reconnecting it to the lagoon inlet. Figure 2-4 shows the

Table 2-1
Riparian Alternative Project Elements[1]

	Excavation Footprint (acres)	Excavation Volume (wet and dry) (cy)	Volume of Vegetative Debris (cy)	Deepest Level of Excavation (NGVD)[2]	Days of Dredging (at 200 cy/hour, 24 hours/day)	Barge Loads to SFDODS	Truckloads of Dry Soil to Redwood Landfill	Truckloads of Chips to Redwood Landfill
North Basin	136	458,550 (wet)	N/A	-4 ft	96	612	N/A	N/A
Main Channel	38	216,250 (wet)	N/A	- 4 ft	45	289	N/A	N/A
Bolinas Channel	16	130,800 (wet)	N/A	- 5 ft	28	175	N/A	N/A
Kent Island	124	376,750 (wet)	3,800	- 2 ft	79	503	N/A	320
Pine Gulch Creek Delta	86	149,100 (wet), 9,550 (dry)	850	- 1 ft	31	199	800	71
Highway 1 Fills	4	4,850 (dry)	N/A	0 ft	N/A	N/A	405	N/A
Dipsea Road	8	37,700 (dry)	N/A	0 ft	N/A	N/A	3150	N/A
South Lagoon Channel	18	89,250 (wet)	N/A	- 4 ft	19	119	N/A	N/A
Totals	**430**	**1,420,700 (wet), 52, 050 (dry)**	**3,800**	**N/A**	**296**	**1897**	**4,355**	**391**

Source: Romanoski 2002

[1] Volumes rounded off to nearest 50 cubic yards.
[2] NGVD is the land datum typically used on US Geological Survey topographic maps. NGVD is commonly referred to as mean sea level because it was based on the average of the mean tide levels at selected locations. However, because it is a national datum, 0 ft NGVD may not necessarily equate to mean sea level in Bolinas Lagoon.
NA - not applicable

North Basin at the far north corner of the lagoon, above Pine Gulch Creek Delta. Any use of this North Basin for increasing tidal prism requires increasing the volume and speed at which water and sediment may be carried from the basin to the lagoon inlet via the Main Channel; therefore, excavation in the North Basin would optimally be coupled with excavation in the Main Channel.

The proposed dredging in the North Basin would restore the historical basin between the -1 foot and -4 feet contours of the NGVD, which is the baseline elevation or land datum typically used on US Geological Survey topographic maps. NGVD is commonly referred to as mean sea level because it was based on the average of the mean tide levels at selected locations. However, because it is a national datum, 0 feet NGVD may not necessarily equate to mean sea level in Bolinas Lagoon. The sides of the North Basin will be cut to a slope of approximately 1V:8H, which is a vertical rise of 1 foot for each 8 feet of horizontal distance.

The Main Channel excavation would restore four sections of the Main Channel (shown on Figure 2-2) to recreate a better hydraulic connection between the North Basin and the rest of the lagoon. An island in the Main Channel would be removed entirely down to -4 feet NGVD. Three channels would be lowered to -3 feet NGVD, with side slopes of 1V:4H. One channel would be lowered to -4 feet NGVD, with side slopes of 1V:4H. Channel sections would vary between 1,280 and 4,070 feet long. One channel would be 140 feet wide at the bottom; the other three would be 120 feet wide at the bottom. These channel configurations are designed to result in more water moving through the lagoon at roughly the same velocity as at present. The excavation of the Main Channel would lead to optimal results if it were to follow the excavation of the North Basin rather than precede it.

Pine Gulch Creek Delta

Pine Gulch Creek feeds into Bolinas Lagoon on the west side of the lagoon, north of the town of Bolinas. Pine Gulch Creek is the largest single tributary of the lagoon, and its watershed constitutes nearly half of the greater Bolinas Lagoon watershed. Since the arrival of European settlers in the 1800s, Pine Gulch Creek has developed an upland area, known as a delta, at its entrance into the lagoon, as a result of both natural and human-influenced processes. (See the FS and the Bolinas Watershed Land Use History in Technical Appendix X, for further discussion.) Some of the delta includes upland habitat for sensitive species, and as a result of concerns regarding this habitat, the project sponsors have consulted with the HEEP to design this alternative to address the sediment buildup in PGC Delta while preserving the existing riparian habitat.

Excavation in PGC Delta would require removal of upland habitat in the delta, primarily shrubs and grasses. This would be followed by excavation: approximately 1 foot to 2 feet of material would be removed from the existing grade between the -1.5-foot and 4-foot NGVD contours. A total of 8.6 acres of upland habitat would be removed from the delta; however, this alternative would not remove any of the riparian habitat in the delta. It would be necessary to grade the land above the expected water level (3 feet to 4 feet NGVD) to maintain a natural gradual grade and to avoid a step or sharp break in grade. The soils removed would be a mix of sands and cobbles, with a high percentage of organic material.

Kent Island

Historical evidence and aerial photographs indicate that there was a system of channels running through Kent Island in the past (Figure 2-5). Excavating Kent Island would restore this historical channel system, create a series of flood shoal islands, and would temporarily remove some of the sediment-trapping salt marshes that have grown up on the island; these marshes are expected to reestablish themselves within a relatively short period. Kent Island overall would be excavated down to 1 to 4 feet NGVD, thus removing the sediment-trapping wetland area and creating lower intertidal and subtidal habitat. Following this, a channel would be excavated through the center of the island. The main part of the channel would be 200 feet wide, would have side slopes of 1V:4H, and would have a bottom elevation of -2.0 feet NGVD. In the northern part of Kent Island, the channel would split into three smaller channels, each with a width of 75 feet, side slopes of 1V:4H, and bottom elevations of -2.0 feet NGVD. The main channel would be 1,560 feet long; the other three would be 690 feet, 1,460 feet, and 2,800 feet long. The excavation of these channels would create a series of small flood shoal islands. The wet sediment taken from Kent Island would range from fine sands to beach sands.

All vegetation and upland material on Kent Island would be removed first by land-based machinery. Because of limited access to the island, the impracticality of transporting the upland material through the town of Bolinas, and various environmental constraints, a barge with a small crane and a small tug boat would be used to bring equipment to the island. The existing vegetation on the island would be removed by cutting, clearing, and mulching using conventional methods, e.g., chainsaw and mulcher. Vegetation that would be hard to remove by conventional methods would be cleared and stockpiled by the amphibious dredge for removal. The mulched vegetation would be taken in containers by barge to the marina at Bodega Bay. This would require approximately two barge trips. Once at Bodega Bay, the material would be offloaded by a hydraulic excavator bucket or a vacuum system into 12-cy trucks, and then trucked to the Redwood Landfill for disposal. The mulch would be disposed of, sold, or recycled.

Bolinas Channel

Excavating Bolinas Channel would consist of dredging the channel that originates near the main inlet of the lagoon, flows between Kent Island and the town of Bolinas, continues to the north, and terminates at PGC Delta (Figure 2-2). Near the north end, the channel would be split into two separate forks. Bolinas Channel would be dredged to a depth of -5.0 feet NGVD, with side slopes of 1V:4H, with the exception of the two forks, which would be dredged to a depth of -4.0 feet NGVD. The main section of Bolinas Channel would be approximately 4,600 feet long and 80 feet wide at the

2-5 Bolinas Lagoon 1942

bottom; the forks would be 800 to 900 feet long and 70 feet wide at the bottom. The material to be removed would be fine sand.

Excavation of Bolinas Channel and Kent Island would create a more direct hydraulic connection between the lagoon inlet and PGC Delta, which has historically been a significant source of sediment coming into the lagoon. Increasing the volume and velocity of the Bolinas Channel would allow a greater volume of sediment from the Pine Gulch Creek watershed to be flushed out of the lagoon instead of being deposited in the PGC Delta or the North Basin.

Highway 1 Fills

Highway 1 along the shore of Bolinas Lagoon has been identified by project sponsors as the location of a suggested upland removal element of the project. Excavation in this area would remove fill between Highway 1 and the edge of the lagoon from unofficial turnouts, illegal disposal sites, and excessive shoulder buildup. At each of the ten fill sites (see Figure 2-2), material would be removed between a minimum elevation of 0 feet and a maximum elevation of 7 feet NGVD. Construction access to these sites would be from Highway 1 and would most likely require temporary lane closures to accommodate the removal operation. Material coming from the Highway 1 sites would range from fine sands to gravel and cobbles.

South Lagoon Channel

The South Lagoon Channel would increase flow in the southern part of Bolinas Lagoon (Figure 2-2). The South Lagoon Channel would consist of a main section running parallel to Dipsea Road and two branches that would extend toward the Main Channel. The branches and main section would have a bottom elevation of -4 feet NGVD and side slopes of 1V:4H. The main section of the South Lagoon Channel would be 80 feet wide at the bottom and 2,710 feet long. The north fork would be 75 feet wide at the bottom and 2,211 feet long. The south fork would be 75 feet wide at the bottom and 3,310 feet long. The material excavated from the South Lagoon Channel would be composed of very fine sand to silt.

Dipsea Road

Excavation along Dipsea Road would remove fill material from between 0 feet and 7 feet NGVD between the eastern sections of Dipsea Road and Bolinas Lagoon, within the Seadrift subdivision on Stinson Beach sand spit (Figure 2-2). Because of regulations governing Bolinas Lagoon, septic systems cannot be closer than 100 feet to the edge of the water. Therefore, to maintain water quality standards in Bolinas Lagoon, fill would be removed only from areas in excess of 100 feet from the middle of Dipsea Road. Material from the Dipsea Road fill area most likely would consist of fine sands to beach sand.

Excavation Schedule

Based on the expected volume of material to be dredged and the dredge's average rate, 290-300 days of round-the-clock dredging would be needed in order to complete the dredging element of this alternative. Over nine years, this averages out to 33 days per year of dredging.

Table 2-2 provides dredging windows for the Riparian Alternative based on sensitive species activity in Bolinas Lagoon. An open window for PGC Delta exists between July and October; an open window for Kent Island exists between August and September. The Highway 1 Fills, Dipsea Road, and the South Lagoon Channel could be excavated any time between August and February. However there are no open windows for excavation in the Bolinas Channel, the Main Channel, or the North Basin. The lead agencies will consult with USFWS, NMFS, the California Department of Fish and Game (CDFG), and GFNMS to identify dredging windows for these areas that minimize impacts on sensitive species. Based on the sensitive species activity identified in Table 2-2, it is likely that most excavation in the lagoon would take place between July and October.

Disposal

Disposal at Redwood Landfill

Redwood Landfill is a Class III facility in northeastern Marin County, northeast of Novato. It is on Redwood Highway on the east side of US Highway 101, about three miles north of where San Marin Drive and Atherton Avenue cross the highway and about one mile north of Gnoss Field Airport. The landfill does not accept sand but has received dredged material from dredging projects in San Francisco Bay (Corps 2001).

Dry soil taken out by land-based excavation equipment would be loaded onto trucks at the excavation site and transported to Redwood Landfill along surface roads. To limit traffic impacts the trucks would use a route that follows Highway 1 north to Point Reyes-Petaluma Road, from there to Novato Boulevard and San Marin Drive, to Highway 101 at the north end of Novato. Other potential but less recommended routes could include traveling south on Highway 1 and then north on US 101, or north along Highway 1 and east to San Rafael and Novato by way of Sir Francis Drake Boulevard.

Mulched material from Kent Island would be loaded onto a shallow barge at Kent Island and transported to Bodega Bay. There it would be offloaded from barges at Bodega Bay and transferred to trucks for transport to Redwood Landfill. The exact route is yet to be determined but could include traveling south on Highway 1 to Valley Ford Road and then southeast on Bodega Avenue or Spring Hill Road to join US 101 in Petaluma, and then south on 101 to the landfill. Only two barge loads would be needed to transport the mulched material to Bodega Bay.

Disposal at San Francisco Deep Ocean Disposal Site

A barge would be required to transport the dredged sediment to the SFDODS, roughly 55 miles southwest of Bolinas Lagoon.

Table 2-2
Sensitive Species Activity in Bolinas Lagoon

Project Element	***JAN***	***FEB***	***MAR***	***APR***	***MAY***	***JUN***	***JUL***	***AUG***	***SEP***	***OCT***	***NOV***	***DEC***
North Basin	Wintering Shorebirds (foraging)	Wintering Shorebirds (foraging)	Wintering Shorebirds (foraging)	Wintering Shorebirds (foraging)	Wintering Shorebirds (foraging)		Wintering Shorebirds (foraging)	Wintering Shorebirds (foraging)	Wintering Shorebirds (foraging)	Wintering Shorebirds (foraging)	Wintering Shorebirds (foraging)	Wintering Shorebirds (foraging)
	American Avocets	American Avocets	American Avocets	American Avocets				American Avocets	American Avocets	American Avocets	American Avocets	American Avocets
	Egrets & Herons (staging)	Egrets & Herons (staging)	(egg formation)	(egg formation)	(feeding nestlings)	(feeding nestlings)	(feeding nestlings)	(juvenile foraging)	(juvenile foraging)	(juvenile foraging)		
						Leopard Sharks (breeding)	Leopard Sharks (breeding)	Leopard Sharks (breeding)				
	Steelhead (juveniles)	Steelhead (juveniles)	Steelhead (juveniles)	Steelhead (juveniles)	Steelhead (juveniles)	Steelhead (juveniles)					Steelhead adults	Steelhead adults
Main Channel							Pelicans, Heermann's Gulls & Terns (& their prey)	Pelicans, Heermann's Gulls & Terns (& their prey)	Pelicans, Heermann's Gulls & Terns (& their prey)	Pelicans, Heermann's Gulls & Terns (& their prey)		
			Harbor Seals (pupping)	Harbor Seals (pupping)	Harbor Seals (pupping)	Harbor Seals (pupping)	Harbor Seals (pupping)					
	Diving Birds	Diving Birds	Diving Birds	Diving Birds	Diving Birds					Diving Birds	Diving Birds	Diving Birds
	Steelhead (juveniles)	Steelhead (juveniles)	Steelhead (juveniles)	Steelhead (juveniles)	Steelhead (juveniles)	Steelhead (juveniles)					Steelhead adults	Steelhead adults
Hwy 1 Fills			Harbor Seals (pupping)	Harbor Seals (pupping)	Harbor Seals (pupping)	Harbor Seals (pupping)	Harbor Seals (pupping)					
Kent Island			Harbor Seals (pupping)	Harbor Seals (pupping)	Harbor Seals (pupping)	Harbor Seals (pupping)	Harbor Seals (pupping)					
	Diving Birds	Diving Birds	Diving Birds	Diving Birds	Diving Birds					Diving Birds	Diving Birds	Diving Birds
	Steelhead (juveniles)	Steelhead (juveniles)	Steelhead (juveniles)	Steelhead (juveniles)	Steelhead (juveniles)	Steelhead (juveniles)					Steelhead adults	Steelhead adults
Bolinas Channel							Pelicans, Heermann's Gulls & Terns (& their prey)	Pelicans, Heermann's Gulls & Terns (& their prey)	Pelicans, Heermann's Gulls & Terns (& their prey)	Pelicans, Heermann's Gulls & Terns (& their prey)		
	Diving Birds	Diving Birds	Diving Birds	Diving Birds	Diving Birds					Diving Birds	Diving Birds	Diving Birds
	Steelhead (juveniles)	Steelhead (juveniles)	Steelhead (juveniles)	Steelhead (juveniles)	Steelhead (juveniles)	Steelhead (juveniles)					Steelhead adults	Steelhead adults
PGC Delta	Steelhead (juveniles)	Steelhead (juveniles)	Steelhead (juveniles)	Steelhead (juveniles)	Steelhead (juveniles)	Steelhead (juveniles)					Steelhead adults	Steelhead adults
South Lagoon Channel			Harbor Seals (pupping)	Harbor Seals (pupping)	Harbor Seals (pupping)	Harbor Seals (pupping)	Harbor Seals (pupping)					
Dipsea Fills								-none-				

In 1994, the US EPA formally designated the SFDODS as an approved location for the "disposal of suitable dredged material removed from the San Francisco Bay region and other nearby harbors or dredging sites" (USEPA 1994). The SFDODS is an area of approximately 6.5 square nautical miles (nmi) approximately 49 nmi west of the Golden Gate, and six nmi west of the boundary of the GFNMS. The SFDODS is also 10 nmi south of the boundary of Cordell Banks National Marine Sanctuary. The disposal site is in waters ranging from 8,200 to 9,800 feet deep (USEPA 1998).

Prior to disposal at SFDODS, the dredged material would be tested for contaminants. Material from Bolinas Lagoon must fall within certain chemical and physical parameters in order to be approved for disposal at SFDODS. Assuming the material from Bolinas Lagoon passes inspection, it would be taken by barge to SFDODS for dumping.

The barge would be towed out of Bolinas Bay, through the GFNMS, past the Farallon Islands, and to the SFDODS. This would take approximately eight hours and perhaps less time to return unloaded. Disposal would entail opening the split hull of the barge and allowing the sediment to drain into the ocean (Joanou 2001).

The environmental impact of disposal at SFDODS is not discussed in this document, as the EIS for establishing the SFDODS as an approved disposal site, published in 1993, contains extensive description and analysis of the impacts of the use of that site for disposing of dredged spoils (USEPA 1993). The reader is also directed to the 1998 *Final EIS/EIR for the Long-Term Management Strategy for the Placement of Dredged Material in the San Francisco Bay Region* (USEPA 1998) for a discussion of disposal at SFDODS.

Disposal Schedule

A fully loaded barge is estimated to be able to make one round trip to SFDODS in approximately 16 hours. Additionally, a 3,000-cubic-yard barge could be loaded with slurry in approximately four hours, which would mean a total of 333 days to load barges with the 1.5 million cy of sediment from the lagoon. Based on this, assuming approximately 2,000 barge loads and a total excavation period of 333 days over nine years, an estimated five barges would be in constant operation 24 hours per day during the excavation period in order to convey all the wet sediment from Bolinas Lagoon to SFDODS under this alternative.

A summary of disposal destinations for material excavated from the lagoon under the Riparian Alternative is provided in Table 2-3.

Equipment and Machinery

Excavation and removal of vegetation, sediment, and dry soil require the use of heavy machinery. Diesel fuel is indispensable to operate machinery and heavy equipment, but refueling such equipment would be limited to designated areas (such as one of the staging areas) so as not to expose sensitive habitats to the possibility of a fuel spill.

Table 2-3
Riparian Alternative
Dredged Material Disposal Sites and Transportation Methods

Excavation Site	Type of Material	Disposal Location	Transportation Method
PGC Delta	Dry soil	Redwood	Truck
	Wet sediment	SFDODS	Barge
	Trees/Vegetation	Redwood	Truck
Bolinas Channel	Wet sediment	SFDODS	Barge
Kent Island	Wet sediment	SFDODS	Barge
	Trees/Vegetation	Redwood	Barge to Bodega Bay, then truck
Main Channel	Wet sediment	SFDODS	Barge
North Basin	Wet sediment	SFDODS	Barge
South Lagoon Channel	Wet sediment	SFDODS	Barge
Highway 1 Fills	Dry soil	Redwood	Truck
Dipsea Road Fills	Dry soil	Redwood	Truck
	Trees/Vegetation	Redwood	Truck

Additionally, best management practices, such as a spill contingency plan, would be incorporated during the construction period. Other best management practices could be used, such as environmentally friendly vegetable oil-based hydraulic fluids, which are considered an industry standard for operating construction equipment near environmentally sensitive areas.

The following is a list of the equipment planned for the project:

- 8-inch hydraulic suction pipeline dredge (amphibious);
- Excavators or large backhoes (number undetermined);
- Dump trucks (number undetermined);
- 2 or more tugboats (3,000-horsepower diesel engine);
- Scows (at least 3) to transport dredge material to SF DODS;
- 2 motorboats capable of transporting up to 10 people;
- Hydraulic excavators;
- Chain saws (2);
- Grinder for wood and vegetation;
- Vacuum apparatus to remove vegetative material from scow used to transport material from Kent Island;
- Pickup trucks used by contractors;
- Portable generators (2);
- Loaders; and

- Cranes.

2.3.2 Estuarine Alternative (NER)

This alternative is identical to the Riparian Alternative except for the excavation in PGC Delta. Excavation under the Estuarine Alternative would take out greater amounts of vegetation, upland soils, and wet sediment than under the Riparian Alternative (Figure 2-6). Implementation of the Estuarine Alternative is estimated to last approximately nine years, and a somewhat larger amount of wet sediment would be taken out of the lagoon. The same types of machinery and disposal locations would be used, and the same schedule limitations would apply.

Pine Gulch Creek Delta

Under this alternative, a large portion of the upland area in PGC Delta would be removed. Approximately 1 to 1.5 vertical feet of material would be removed from the existing grade between the -1 foot and 4 feet NGVD contours. This would require removing 11 acres of upland habitat in the delta, including 7 of the 17 acres of riparian habitat in the delta. It would be necessary to grade the land above the expected water level (3 feet to 4 feet NGVD) to maintain a natural gradual grade and to avoid a step or sharp break in grade. The material removed would be a mix of sands and cobbles with a high percentage of organic material. In addition, a large amount of vegetation, including trees and shrubs, would be removed.

Table 2-4 provides a summary of volumes and acreages for the Estuarine Alternative.

2.3.3 No Action/No Project Alternative

NEPA requires that every EIS consider a No Action Alternative, while CEQA requires that every EIR consider a No Project Alternative. Under some circumstances these may result in different analyses, but here these alternatives are much the same, compared to the project alternatives.

The No Action/No Project (referred to as No Action) Alternative would entail taking no further action to address sedimentation in the lagoon but would leave in place existing management plans and policies. This would include the Bolinas Lagoon Management Plan, existing management plans and policies administered by other authorities, such as GFNMS, Golden Gate National Recreation Area (GGNRA), and Point Reyes National Seashore (PRNS), as well as applicable state and federal resources management laws and regulations. Evaluating this alternative includes determining the future impact of these plans and policies in the absence of any dredging or other sediment removal activities in the lagoon. The No Action Alternative is based on the existing conditions of Bolinas Lagoon and the adjacent properties, described in Section 3 of this EIS/EIR, as projected forward by the Corps' modeling of hydraulic processes and other conditions in the lagoon over the next 60 years.

2-6 Estuarine Alternative Excavation Sites

Table 2-4
Estuarine Alternative Project Elements

	Excavatio n Footprint (acres)	Excavation Volume (wet and dry) (cy)[1]	Volume of Vegetative Debris (cy)	Deepest Level of Excavation (NGVD)[2]	Days of Dredging (at 200 cy/hour, 24 hours/day)	Barge Loads to SFDODS	Truckloads of Dry Soil to Redwood Landfill	Truckloads of Chips to Redwood Landfill
North Basin	136	458,550 (wet)	N/A	-4 ft	96	612	N/A	N/A
Main Channel	38	216,250 (wet)	N/A	- 4 ft	45	289	N/A	N/A
Bolinas Channel	16	130,800 (wet)	N/A	- 5 ft	28	175	N/A	N/A
Kent Island	124	376,750 (wet)	3,800	- 2 ft	79	503		320
Pine Gulch Creek Delta	103	155,950 (wet), 34,750 (dry)	11,300	- 1 ft	31	208	2,900	950
Highway 1 Fills	4	4,850 (dry)	N/A	0 ft	N/A	N/A	405	N/A
Dipsea Road	8	37,700 (dry)	N/A	0 ft	N/A	N/A	3,150	N/A
South Lagoon Channel	18	89,250 (wet)	N/A	- 4 ft	19	119	N/A	N/A
Totals	**445**	**1,427,550 (wet) 77,250 (dry)**	**15,100**		**298**	**1906**	**17,455**	**1,270**

Source: Romanoski 2002

[1] Total volumes rounded off to nearest 50 cubic yard.
[2] NGVD is the land datum typically used on US Geological Survey topographic maps. NGVD is commonly referred to as mean sea level because it was based on the average of the mean tide levels at selected locations. However, because it is a national datum, 0 ft NGVD may not necessarily equate to mean sea level in Bolinas Lagoon.
NA – not applicable

One possibility under the No Action alternative would be that all agencies would cease management activities in the lagoon and the surrounding watershed. All erosion control and lagoon management activities would cease. While it is not reasonable to expect this, it is mentioned here as an example to the public of the highest level of environmental damage possible under the No Action Alternative.

2.4 OTHER PROJECT COMPONENTS

2.4.1 Watershed-Level Actions

In 2000 and 2001, the Corps conducted a study of sediment movement and erosion in the Bolinas Lagoon watershed (see Technical Appendix A). This study identified sediment sources, developed a sediment budget for the watershed, and constructed a model to determine future sediment inputs into the lagoon from the watershed. This study concluded that the watershed was no longer a significant source of sediment for the lagoon and that efforts to reduce erosion in the watershed would have minimal impact on sedimentation in the lagoon. Based on this finding, the Corps has not proposed watershed-level actions as part of this study; however, the Corps could pursue sediment control projects that focus on aquatic or habitat restoration under the Continuing Authorities Program if a local group or agency willing to share costs asked the Corps to participate.

2.4.2 Timing and Adaptive Management

Implementing either of the project alternatives would require a multi-year process, during which project scheduling would be constrained by weather, traffic, disposal site capacity, availability and capacity of dredges and disposal barges, fishing boat traffic in the lagoon and Bolinas Bay, and the seasonal activity of sensitive species in the lagoon. In coordination with the HEEP, the lead agencies would develop an implementation schedule during the project design phase, which would take into account all of these factors. Table 2-2 provides an overview of sensitive species activities in the lagoon, which illustrates the difficulty of scheduling excavation work.

Adaptive Management Planning

To facilitate long-term planning and implementation of solutions for the Bolinas Lagoon Ecosystem Restoration Project, a comprehensive Bolinas Lagoon Comprehensive AMP is being developed that would provide a roadmap for the long-term stabilization, enhancement, and management of the lagoon. The plan would be comprehensive in nature, covering all the important issues facing the lagoon, but also would be easily adaptable, in order to reflect the changing conditions and needs of the lagoon. The Bolinas Lagoon Comprehensive AMP is not intended to be a capital improvement plan, focusing just on implementing engineering solutions. Instead, this document would serve as the basis for consideration of implementation of the actions recommended by the HEEP and as a guidance instrument from which to develop a long-term management plan with full stakeholder involvement.

Adaptive management provides for studies and management programs that can be adapted to uncertain or unforeseen circumstances. A well-designed adaptive management plan anticipates as many circumstances as possible before designing monitoring and data assessment approaches. The AMP would identify circumstances or issues that may include potential limiting factors, such as stream flow, erosion and sedimentation rates, or problems with restoration activities or operation. However, not all of these factors may be anticipated. Some of the unanticipated factors could include institutional changes (e.g., changes to the ESA or other laws), new natural resource management directives (e.g., maximizing tidal exchange, increasing seal haul-out areas), newly understood ecological phenomena (e.g., global climate change), or land and water use changes (e.g., upstream development). Some unanticipated factors, such as toxic spills, may fall outside of the scope of the plan and would be addressed through other programs or directives, while others might be shown to be related shortcomings in the project that could arguably be included under these adaptive management objectives, such as possible beach erosion.

If a trigger event occurs (indicating an objective has not been met), then an adaptive response would be required. This could involve further diagnostic studies, modification of the restoration activities or operations, or changes to natural features of the project area, designed to bring the system closer to achieving the objective. All responses must be feasible, practical, reasonable, prudent, and acceptable to the local community, though this does not preclude potentially major modifications to project facilities or operations. Each response would have response limits that describe the absolute scope of actions that can be taken in response to a trigger event.

In general, response limits under the AMP would be determined by consensus, guided by principles of feasibility, practicality, reasonability, prudence, and local community acceptance, and would conform to limits identified by the Corps. Possible adaptive responses that fall outside of the project's scope, such as major upstream modifications, would require further decisions through the established Corps processes. In addition, nothing in the AMP is intended to bind Marin County or the Corps or otherwise limit their respective authorities in the performance of their responsibilities under applicable state and federal laws.

All adaptive responses would be evaluated, and outcomes of those adaptive responses would be compared to the objective. If the objective has been met, then the original monitoring and data assessment approach would be resumed. If the objective is still not met, the monitoring and data assessment approach may be modified to diagnose the problem.

An important component of the adaptive management process would be reporting, which includes emergency reporting procedures, regular periodic reporting, and final long-term reporting. An annual adaptive management report would summarize all data collected under these monitoring and data assessment approaches and would present analyses required within each objective. Certified raw data and reports generated under these objectives would be updated to appropriate agency and publicly accessible/locally endorsed and maintained information systems using database standards.

The AMP is under development and would be finalized as part of the Project Engineering Design (PED) phase of the project, following completion of the FS and certification of the EIS/EIR. Finally, the AMP would identify the funding source for each adaptive management objective, specifying who would fund studies, responses, and reporting.

2.5 Alternatives Considered but Removed from Consideration

This section incorporates by reference the discussion of plan formulation and plan evaluation in sections 4 and 5 of the FS.

2.5.1 Jetties in Bolinas Bay

During the project planning phase, the Corps discussed the construction of two 1,000-foot jetties into Bolinas Bay, outside the lagoon inlet, designed to prevent sand from washing into the lagoon at the inlet. This would not restore habitat in the lagoon but would help prevent the lagoon from closing by keeping the inlet open for a more extended period. This option was discussed but was removed from further consideration for a variety of reasons, including the following:

- It would violate GFNMS regulations;
- It meets only one of the project objectives, that of keeping the inlet open, and does not add tidal prism or restore lost habitat;
- It would need to be maintained with regular dredging, which would be cost-prohibitive and would not be permitted under GFNMS regulations;
- It would not have public support; and
- It would be an eyesore in the natural setting.

2.5.2 Dredging Alternatives

As discussed extensively in sections 4, 5, and 6 of the FS, the lead agencies considered a wide variety of dredging alternatives during the project planning phase of the FS. Several of these other alternatives included excavation in Seadrift Lagoon, opening Seadrift Lagoon to full tidal flushing, and excavating only some of the project elements identified under the riparian and estuarine alternatives.

These alternatives were removed from further consideration for a variety of reasons, among them:

- Excavation in Seadrift Lagoon would violate Corps policy not to enhance human environments;

- Opening up Seadrift Lagoon would require the Corps to exercise eminent domain over private property in order to construct channels to open the lagoon to full tidal flushing;
- Seadrift Lagoon is not considered to be valuable habitat;
- The additional cost of work in Seadrift Lagoon would not result in proportional increases in intertidal and subtidal habitat; and
- As discussed in sections 4 and 5 of the FS, limited excavation alternatives were determined to return too little environmental benefit at only a slightly reduced cost.

Extensive discussion of the merits and flaws of earlier project proposals can be found in sections 4, 5, and 6 of the FS.

2.5.3 Disposal Alternatives

The Corps estimates that roughly 1.4 million cy of material would have to be removed from the lagoon to achieve project goals. Although disposing of this material locally would be preferable, there is no appropriate disposal location within the watershed. Disposing dredged sediment within the watershed, which is topographically varied and subject to erosion, could result in the same material being redeposited into the lagoon within a relatively short time. The decision was made, therefore, not to pursue the possibility of disposal within the watershed.

One possibility for local disposal was the use of five abandoned quarries within PRNS; however, these quarries would provide only 50,000 to 75,000 cubic yards of disposal volume and could accept only dry (upland) materials. Because of concerns regarding seed dispersal from invasive exotic plants, soil erosion, and water quality issues in the PRNS, any materials deposited there would have to be carefully screened before disposal. Additionally, the lead agencies would be required to pay for designing, constructing, maintaining, restoring, and revegetating the quarries. These requirements are both substantial and financial and make the quarries less desirable as disposal sites.

Using the sediment excavated from the lagoon for beach fill also was considered; however, on further analysis, the Corps found that the grain size was too small and the color was inappropriate for beach use. In addition, the GFNMS , which has jurisdiction over such activities in the project area, would not permit this use.

Potential disposal sites farther from the project site included Bel Marin Keys in Marin County, Altamont Landfill in Livermore, and Montezuma Wetlands in Suisun Bay. All of these sites were determined to be far enough away that their use would result in unacceptable traffic and air quality impacts, as well as high project costs.

As discussed in the FS, Hamilton Army Airfield (HAAF) in Novato was seriously considered as a disposal site for the material removed from Bolinas Lagoon. HAAF is the site of a project to restore seasonal and tidal wetlands on close to 1,000 acres of subsided diked baylands, adjacent Navy ballfields, and the decommissioned antenna field. The restoration site is bounded on the east by San Pablo Bay, on the west by US Highway 101 and the former air base facilities, on the north by Bel Marin Keys, and on the south by property belonging to St. Vincent's Catholic Youth Organization. HAAF was chosen as a disposal site because the clean state of the dredged material from Bolinas Lagoon made it appropriate for reuse in the HAAF wetland restoration project. The material would have been used to raise low elevation areas, now protected by levees and pumps, to recreate tidal wetlands at higher elevations. Material from Bolinas would have been transported to HAAF by barge through the Golden Gate and north into San Pablo Bay. There it would have been discharged to an off-loader anchored in San Pablo Bay off shore of the HAAF. Accurate cost estimates of using the Hamilton disposal site for the Bolinas Lagoon project cannot be calculated due to uncertainties in piping, site management, and operations and maintenance costs of the disposal site.

2.6 Comparison of Alternatives, Including Impacts and Mitigation

NEPA requires that the EIS present the alternatives in comparative form to define the issues and to provide decision-makers and the public with a clear basis for choice among options. Tables 2-5 and 2-6 provide a summary of the effects on habitat and hydrology that are predicted as a result of the alternatives. Table 2-7 provides a summary of the environmental impacts of each alternative.

The final EIS/EIR will include a mitigation monitoring plan (MMP) for approval and certification by the lead agencies. The MMP would identify specific measures to be taken in order to track the mitigation measures identified under this EIS/EIR. As required by CEQA, Marin County must certify that the EIS/EIR was prepared in compliance with CEQA and was presented to the County's decision-making body for review and consideration. In order to support its decision on the project, the County must prepare and adopt written findings of fact for each significant environmental impact identified in the EIS/EIR. Specifically, the County must find that, for each significant impact identified, the project has been changed (including adoption of mitigation measures) to avoid or substantially reduce the magnitude of the impacts identified in the EIS/EIR. If no feasible mitigation measures can be identified to reduce a significant impact to less than significant level, the County must issue a Statement of Overriding Considerations discussing those impacts and justifying its approval of the project.

2.7 Environmentally Preferable/Environmentally Superior Alternative

NEPA requires that an environmentally preferable alternative be identified, and CEQA requires that an environmentally superior alternative be identified. To achieve this, environmental impacts were compared among the project alternatives for the resource areas analyzed in Section 4. This comparison determined which alternative(s) would result in the fewest overall adverse environmental impacts for each resource area.

A summary of significant impacts and applicable mitigation from each of the alternatives is provided in Table 2-7. CEQA guidelines require that if the environmentally superior alternative is the 'no project' alternative, the EIS/EIR shall also identify an environmentally superior alternative among the other alternatives.

The No Action Alternative would be environmentally superior to the Riparian or Estuarine Alternatives because it would result in three identified unmitigable significant impacts, compared with seven unmitigable significant impacts from the Riparian Alternative and eight unmitigable significant impacts from the Estuarine Alternative. However the No Action Alternative would not meet the project objectives of increasing the volume of tidal prism and restoring intertidal and subtidal habitats in Bolinas Lagoon; therefore designation of another environmentally superior alternative is appropriate under CEQA.

The Riparian Alternative would be the environmentally superior alternative, because this alternative would create fewer impacts as compared to the Estuarine Alternative. The Riparian Alternative would result in seven significant and unmitigated impacts and 11 significant but mitigated impacts, compared to the Estuarine Alternative, which would result in eight significant and unmitigated impacts and 14 significant and mitigated impacts. As discussed in Section 4, the Riparian Alternative would present fewer environmental impacts than the Estuarine Alternative, because it would not remove the riparian vegetation in PGC Delta. The Riparian Alternative would meet the project goal of increasing tidal volume in Bolinas Lagoon, would in the long term produce the same acreages of subtidal and intertidal habitat as the Estuarine Alternative (see Table 2-6), would result in fewer significant impacts, would result in the loss of less jurisdictional wetland, and would not conflict with the Marin County Local Coastal Plan (LCP), as discussed in Section 4.7.

Compared to the Estuarine Alternative, the Riparian Alternative would avoid impacts relating to the conflict with the LCP, recreation access to PGC Delta, potential impacts to the federally endangered California Red-Legged Frog, and water quality from excavating organic soils in PGC Delta.

2.8 CONSISTENCY WITH FEDERAL AND STATE LAWS

Table 2-8 provides a brief overview of major federal and state laws with which the lead agencies must comply during project planning or before project construction.

Table 2-5
Dredging Alternative Results

Alternative	Volume of Excavated Material (cy)	Dredged Footprint (acres)	Lagoon Tidal Prism (cy)	Tidal Prism Compared to 1998 (cy)	Closure Index[1]
No Project (1998)	N/A	N/A	5,126,588	N/A	10.5
Estuarine Alternative (2008)	1,504,800	447	6,567,513	+1,440,925	8.1
Riparian Alternative (2008)	1,472,750	430	6,559,185	+1,432,597	8.1
No Action/No Project (2008)	0	0	4,883,508	-243,0800	11.2
No Action/No Project (2058)	0	0	3,841,791	-1,284,797	16.1

Source: Romanoski 2002

Notes:

[1]Inlet closure is possible at an index of 15.
NA – not applicable

Table 2-6
Lagoon Habitat Totals after Construction

Alternative	Subtidal Habitat Acreage	Subtidal Habitat Volume (cy)	Intertidal Habitat Acreage	Intertidal Habitat Volume (cy)	Upland Habitat Acreage
No Project (1998 conditions)	146.39	523,318	848.53	3,584,714	238.10
Estuarine Alternative					
2008	284.47	890,366	832.87	5,460,468	117.47
2018	205.82	627,984	873.01	5,355,085	165.11
2038	184.78	590,921	864.34	4,728,183	190.96
2058	166.01	557,866	856.61	4,169,080	214.01
Riparian Alternative					
2008	285.39	894,995	827.31	5,448,416	121.97
2018	205.41	627,264	872.84	5,342,896	165.61
2038	184.37	590,201	864.17	4,715,994	191.46
2058	165.6	557,146	856.44	4,156,891	214.51
No Action/No Project					
2008	134.45	502,281	843.61	3,228,889	252.77
2018	123.07	482,246	838.92	2,890,014	266.74
2038	102.03	445,183	830.25	2,263,112	292.59
2058	83.26	412,128	822.52	1,704,008	315.64

Source: Romanoski 2002

Table 2-7
Summary of Potential Significant Impacts

Resource Category	No Action/No Project	Riparian Alternative	Estuarine Alternative
Air Quality and Odor	No significant impacts are expected.	No significant impacts are expected.	No significant impacts are expected.
Biological Resources	*Impact 4.3.5: Loss of Habitats (SU)* Increasing sedimentation and eventual closure of the lagoon would result in loss of open water, salt marsh, riparian, and transitional habitats and associated plant and animal species. *Mitigation:* No mitigation has been identified for this impact.	*Impact 4.3.1: Impact on Benthic Invertebrates (SU)* Dredging activities would directly disrupt benthic communities in the lagoon bottom and would indirectly affect animal life, such as birds and fish that feed on benthic invertebrates. *Mitigation:* No mitigation has been identified for this impact. *Impact 4.3.2: Loss of Jurisdictional Wetland (SU)* More than 5 acres of jurisdictional wetland would be destroyed and converted to mudflat or open water under this alternatives. *Mitigation:* No mitigation has been identified for this impact. *Impact 4.3.3 Loss of Black Rail Habitat: (SU)* Excavation of salt marsh habitat would cause significant impacts to the state-listed as threatened California black rail. *Mitigation:* no mitigation has been identified for this impact.	*Impact 4.3.1: Impact on Benthic Invertebrates (SU)* Dredging activities would directly disrupt benthic communities in the lagoon bottom and would indirectly affect animal life, such as birds and fish that feed on benthic invertebrates. *Mitigation:* No mitigation has been identified for this impact. *Impact 4.3.2: Loss of Jurisdictional Wetland (SU)* More than 5 acres of jurisdictional wetland would be destroyed and converted to mudflat or open water under this alternatives. *Mitigation:* No mitigation has been identified for this impact. *Impact 4.3.3 Loss of Black Rail Habitat: (SU)* Excavation of salt marsh habitat would cause significant impacts to the state-listed as threatened California black rail. *Mitigation:* no mitigation has been identified for this impact. *Impact 4.3.4: Impact to the California Red-Legged Frog (SM)* Removal of riparian habitat in PGC Delta would affect possible red-legged frog habitat. *Mitigation 4.3.4:* surveys and compliance with USFWS protocols.

Table 2-7
Summary of Potential Significant Impacts *(continued)*

Resource Category	No Action/No Project	Riparian Alternative	Estuarine Alternative
Cultural Resources	No significant impacts are expected.	*Impact 4.5.1: Damage to Undiscovered Cultural Resources (SM)* Under this alternative, impacts could include the possible destruction of both previously recorded and undiscovered archaeological sites or sensitive Native American sites. Dredging operations that disturb strata below the 50-year-old silt deposition level and land-based excavation of upland sites could encounter archaeological sites. *Mitigation 4.5.1:* Any removed dredge material should be monitored by a qualified archaeologist, who would have the authority to stop work, record the material, and determine potential significance. Native Americans should be consulted before any ground-disturbing activities begin to determine if sensitive resources could be affected. Areas within Bolinas Bay that could be affected either by barge anchoring or disposal pipeline dragging should be surveyed for cultural resources.	*Impact 4.5.1: Damage to Undiscovered Cultural Resources (SM)* Under this alternative, impacts could include the possible destruction of both previously recorded and undiscovered archaeological sites or sensitive Native American sites. Dredging operations that disturb strata below the 50-year-old silt deposition level and land-based excavation of upland sites could encounter archaeological sites. *Mitigation 4.5.1:* Any removed dredge material should be monitored by a qualified archaeologist, who would have the authority to stop work, record the material, and determine potential significance. Native Americans should be consulted before any ground-disturbing activities begin to determine if sensitive resources could be affected. Areas within Bolinas Bay that could be affected either by barge anchoring or disposal pipeline dragging should be surveyed for cultural resources.
Geology, Soils, & Seismicity	*Impact 4.4.2: Inlet Channel Narrowing or Closure (SM)* A reduction in the tidal prism of the lagoon would eventually reduce the power of tidal flows and would result in closure of the lagoon entrance channel. Narrowing or closing the lagoon would accelerate sediment deposition. Freshwater inflows to the lagoon would continue, and some of the freshwater would seep through the permeable sand spit. *Mitigation 4.4.2:* A number of engineering options are available for releasing the water from the lagoon, and it can be assumed that some workable engineering solution could be found. An example of the type of measure that might be used to keep the inlet channel open, in spite of a reduced tidal prism, is construction of groins seaward of the mouth of the lagoon.	*Impact 4.4.1: Erosion of the Tidal Inlet Channel and Banks (SM)* Increased tidal flow velocities at the inlet may increase erosion of the beach at the base of the cliffs on the west side of the channel inlet and could increase erosion of the cliffs themselves. Similarly, enhanced bank erosion or channel scouring could affect the embankment supporting Wharf Road. Undermining the coastal bluff and Wharf Road would be significant impacts, if they were to occur. *Mitigation 4.4.1:* Enhanced erosion of the bluffs on the west bank of the inlet channel could be partially mitigated by placing protection structures at the base of the bluff, including riprap, cement walls, or bluff armoring. The rate of erosion would be monitored to determine if mitigation is warranted.	*Impact 4.4.1: Erosion of the Tidal Inlet Channel and Banks (SM)* Increased tidal flow velocities at the inlet may increase erosion of the beach at the base of the cliffs on the west side of the channel inlet and could increase erosion of the cliffs themselves. Similarly, enhanced bank erosion or channel scouring could affect the embankment supporting Wharf Road. Undermining the coastal bluff and Wharf Road would be significant impacts, if they were to occur. *Mitigation 4.4.1:* Enhanced erosion of the bluffs on the west bank of the inlet channel could be partially mitigated by placing protection structures at the base of the bluff, including riprap, cement walls, or bluff armoring. The rate of erosion would be monitored to determine if mitigation is warranted.

Table 2-7
Summary of Potential Significant Impacts *(continued)*

Resource Category	No Action/No Project	Riparian Alternative	Estuarine Alternative
Hydrology & Water Resources	*Impact 4.2.5: Lagoon Closure (SU)* Under the No Action Alternative, the PGC Delta is projected to continue to aggrade and expand, and the tidal prism of the lagoon would continue to decrease. Temporary or intermittent closure of the inlet channel is predicted as soon as 2058. However, the changes in water quality and loss of a significant water resource (the lagoon) would be of a magnitude that would be considered significant if they were caused by human action. These impacts are not mitigable, except by increasing the tidal prism. *Mitigation*: No mitigation has been identified for this impact. *Impact 4.2.6: Flooding Impacts (SM)* The closure of the lagoon inlet could result in a significant increase in the risk of flooding of developed areas. *Mitigation 4.2.6:* The hazard of flooding might be mitigable through engineering action to create a permanent outflow structure, but the feasibility of this has not been evaluated. Alternatively, the sand spit could be artificially breached, as needed, to prevent flooding. It is also possible that groins might prevent sand from accumulating in the inlet channel and might enable the channel to remain open despite a decreasing tidal prism.	*Impact 4.2.1: Subsidence impacts from Earthquake Activity (SU)* A strong earthquake would cause liquefaction of the sand spit and probably a general leveling of the lagoon bottom, as well as widespread destruction of structures underlain by sandy sediments. While not an impact of the project, these conditions would form the backdrop for additional hydraulic effects related to the project. *Mitigation:* No mitigation has been identified for this impact. *Impact 4.2.2: Water Quality Impacts from Construction (SM)* During construction, dredging would increase suspended sediment in the vicinity of the dredging activity. Exposing these sediments by dredging and excavating could result in a significant but mitigable impact on water quality. *Mitigation 4.2.2:* Sediment samples could be collected and tested during the PED phase. The use of small cutterhead dredges would reduce the impacts of turbidity. Sediment curtains or other barriers would be used to isolate areas being dredged from ambient conditions. Water quality monitoring would allow adjustments to reduce adverse effects. *Impact 4.2.3: Long-Term Water Circulation Impacts (SM)* Changes in the shape of the bottom of the lagoon may substantially change circulation patterns within the lagoon, resulting in uncertain impacts. An example of an undesirable result would be the creation of a large pool that would not fill or drain adequately and therefore would experience radical variations in water quality. *Mitigation 4.2.3:* Sediment transport modeling would be performed during PED. Potential adverse effects on lagoon circulation patterns would be identified by monitoring water quality and flow patterns, monitoring bathymetric	*Impact 4.2.1: Subsidence impacts from Earthquake Activity (SU)* A strong earthquake would cause liquefaction of the sand spit and probably a general leveling of the lagoon bottom, as well as widespread destruction of structures underlain by sandy sediments. While not an impact of the project, these conditions would form the backdrop for additional hydraulic effects related to the project. *Mitigation:* No mitigation has been identified for this impact. *Impact 4.2.2: Water Quality Impacts from Construction (SM)* During construction, dredging would increase suspended sediment in the vicinity of the dredging activity. Exposing these sediments by dredging and excavating could result in a significant but mitigable impact on water quality. *Mitigation 4.2.2:* Sediment samples could be collected and tested during the PED phase. The use of small cutterhead dredges would reduce the impacts of turbidity. Sediment curtains or other barriers would be used to isolate areas being dredged from ambient conditions. Water quality monitoring would allow adjustments to reduce adverse effects. *Impact 4.2.3: Long-Term Water Circulation Impacts (SM)* Changes in the shape of the bottom of the lagoon may substantially change circulation patterns within the lagoon, resulting in uncertain impacts. An example of an undesirable result would be the creation of a large pool that would not fill or drain adequately and therefore would experience radical variations in water quality. *Mitigation 4.2.3:* Sediment transport modeling would be performed during PED. Potential adverse effects on lagoon circulation patterns would be identified by monitoring water quality and flow patterns, monitoring bathymetric

Table 2-7
Summary of Potential Significant Impacts *(continued)*

Resource Category	No Action/No Project	Riparian Alternative	Estuarine Alternative
		changes, and observing the circulation patterns.	changes, and observing the circulation patterns. *Impact 4.2.4: Water Quality Impacts from Excavation Materials (SM)* During delta dredging, spillage would contribute to turbidity. Spilled sediment may enrich nutrient levels in the lagoon water, enhancing algae growth. Deltaic sediments are probably chemically reduced, so that when exposed to air, the sediments would liberate swampy odors and possibly some toxic forms of natural compounds. *Mitigation 4.2.4:* Dredging impacts would be monitored to ensure that water quality is not significantly affected, and dredging would be performed slowly and during periods that are not critical for migrating fish. The rate of dredging may be reduced or the dredged area may be kept isolated from the lagoon to maintain effects below a significant level.

Table 2-7
Summary of Potential Significant Impacts *(continued)*

Resource Category	No Action/No Project	Riparian Alternative	Estuarine Alternative
Land Use	No significant impacts are expected.	*Impact 4.7.1: Compatibility with Uses at the Project Site (SM)* Project measures include installing a slurry pipeline in the lagoon; during high tide the pipeline would float, and during low tide it would likely rest on the mudflats. Therefore, current uses of the lagoon for recreation would be interrupted at certain times of the year. *Mitigation 4.7.1:* This impact on kayakers and Seadrift recreational boaters would be mitigated by submerging the pipeline at one or two places along its length within the lagoon.	*Impact 4.7.1: Compatibility with Uses at the Project Site (SM)* Project measures include installing a slurry pipeline in the lagoon; during high tide the pipeline would float, and during low tide it would likely rest on the mudflats. Therefore, current uses of the lagoon for recreation would be interrupted at certain times of the year. *Mitigation 4.7.1:* This impact on kayakers and Seadrift recreational boaters would be mitigated by submerging the pipeline at one or two places along its length within the lagoon. *Impact 4.7.2: Consistency with Countywide Plan and LCP. (SU)* Because the Estuarine Alternative requires vegetation removal in the riparian protection area of Pine Gulch Creek, there would be a significant impact. No mitigation is suggested. *Mitigation 4.7.2:* Apply best management practices to control erosion and runoff and restore disturbed areas by replanting them with plant species naturally found on the site. While this would lessen the long-term biological impacts, such a mitigation measure would not remove the conflict with Stream Protection Policy II-4 and would not mitigate the impact below the level of significance.
Marine Transportation	No significant impacts are expected.	No significant impacts are expected.	No significant impacts are expected.

Table 2-7
Summary of Potential Significant Impacts *(continued)*

Resource Category	No Action/No Project	Riparian Alternative	Estuarine Alternative
Noise	No significant impacts are expected.	*Impact 4.11.1: Noise from Dredging (SM)* Because noise levels from dredging in the southern part of Bolinas Lagoon might produce CNEL levels above 60 dBA in the Seadrift development and in portions of Bolinas, this impact is considered potentially significant. *Mitigation 4.11.1:* Noise mitigation opportunities should be reasonably available by selecting quieter running equipment and by providing supplemental noise shielding around engines and pumps. Noise level reductions of 10 dBA or more (compared to noise levels illustrated in Figure 4-1) should be possible by selecting dredging equipment that produces noise levels below 80 dBA at 50 feet or by installing acoustical shielding panels around the sides of engine and pump equipment on the dredge. *Impact 4.11.2: Noise from Vegetation Clearing Activity (SM)* Because noise levels from vegetation clearing on Kent Island might exceed 70 dBA in Bolinas and portions of Seadrift, this impact is considered potentially significant. *Mitigation 4.11.2:* Noise can be mitigated by limiting mulching and clearing to daytime hours, locating the equipment on the side of Kent Island farthest from residences, and screening the machinery on three sides.	*Impact 4.11.1: Noise from Dredging (SM)* Because noise levels from dredging in the southern part of Bolinas Lagoon might produce CNEL levels above 60 dBA in the Seadrift development and in portions of Bolinas, this impact is considered potentially significant. *Mitigation 4.11.1:* Noise mitigation opportunities should be reasonably available by selecting quieter running equipment and by providing supplemental noise shielding around engines and pumps. Noise level reductions of 10 dBA or more (compared to noise levels illustrated in Figure 4-1) should be possible by selecting dredging equipment that produces noise levels below 80 dBA at 50 feet or by installing acoustical shielding panels around the sides of engine and pump equipment on the dredge. *Impact 4.11.2: Noise from Vegetation Clearing Activity (SM)* Because noise levels from vegetation clearing on Kent Island might exceed 70 dBA in Bolinas and portions of Seadrift, this impact is considered potentially significant. *Mitigation 4.11.2*: Noise can be mitigated by limiting mulching and clearing to daytime hours, locating the equipment on the side of Kent Island farthest from residences, and screening the machinery on three sides.

Table 2-7
Summary of Potential Significant Impacts *(continued)*

Resource Category	No Action / No Project	Riparian Alternative	Estuarine Alternative
Recreational Resources	*Impact 4.6.3: Long-Term Impacts: Lagoon Recreation Access (SU)* Failure to address sedimentation in Bolinas Lagoon is likely to have significant impacts on a variety of recreational uses in the lagoon, including fishing, kayaking, and wildlife viewing. *Mitigation*: No mitigation has been identified for this impact.	*Impact 4.6.1: Lagoon Recreation Access (SM)* The presence of the pipeline in the lagoon would have an additional impact on recreational use of the lagoon. Because the dredge would at least sometimes be at the north end of the lagoon, the pipeline would necessarily interfere with kayakers attempting to cross the lagoon. Motorboats would be similarly affected by the presence of the pipeline; the residents of Seadrift put in their motorboats from the boat launch on the northwest of the Seadrift development. *Mitigation 4.6.1:* This impact on kayakers and Seadrift recreational boaters would be mitigated by submerging the pipeline at one or two places along its length within the lagoon. This mitigation would provide for some recreational access for motorboats and kayaks during the construction period.	*Impact 4.6.1: Lagoon Recreation Access (SM)* The presence of the pipeline in the lagoon would have an additional impact on recreational use of the lagoon. Because the dredge would at least sometimes be at the north end of the lagoon, the pipeline would necessarily interfere with kayakers attempting to cross the lagoon. Motorboats would be similarly affected by the presence of the pipeline; the residents of Seadrift put in their motorboats from the boat launch on the northwest of the Seadrift development. *Mitigation 4.6.1:* This impact on kayakers and Seadrift recreational boaters would be mitigated by submerging the pipeline at one or two places along its length within the lagoon. This mitigation would provide for some recreational access for motorboats and kayaks during the construction period.. *Impact 4.6.2: Lagoon Recreation Access (SM)* Removing seventeen additional acres of delta and upland habitat along Pine Gulch Creek under this alternative would substantially prevent year-round use of that area for hiking, walking, or wildlife viewing. *Mitigation 4.6.2:* While seventeen acres of the delta and upland habitat would be removed, much of the reserve would be left in place, and MCOSD could build new trails or provide educational materials to explain the project and its projected benefits.
Public Services and Utilities	No significant impacts are expected.	No significant impacts are expected.	No significant impacts are expected.
Socioeconomics and Population	No significant impacts are expected.	No significant impacts are expected.	No significant impacts are expected.
Transportation	No significant impacts are expected.	No significant impacts are expected.	No significant impacts are expected.

Table 2-7
Summary of Potential Significant Impacts *(continued)*

Resource Category	No Action/No Project	Riparian Alternative	Estuarine Alternative
Visual Resources	No significant impacts are expected.	*Impact 4.12.1: Alteration of Terrain and Water (SU)* During and after project construction, immediate impacts would include significantly altering the terrain of the lagoon by changing the lagoon shoreline at Pine Gulch Creek Delta and Dipsea Road and along Highway 1; immediate impacts would also include changes in water flow, volume, location, and possibly color all through the lagoon. *Mitigation*: No mitigation has been identified for this impact. *Impact 4.12.2: Short-Term Changes in Vegetation (SU)* The Riparian Alternative would remove over 100 acres of upland habitat, including all the vegetation on Kent Island, but would retain the mature trees in the PGC Delta. This would significantly change the view from the eastern and northern shores of the lagoon, as well as from viewing locations along Highway 1 and along the hiking trails on Bolinas Ridge. While the impact would be less than that under the Estuarine Alternative because the mature trees in the PGC Delta would be left in place, this would be a significant impact under Marin County guidelines. *Mitigation*: No mitigation has been identified for this impact. *Impact 4.12.3: Long-Term Changes in Vegetation (SU)* Compared to the No Action Alternative in 2058, the Riparian Alternative in 2058 would result in there being 100 fewer acres of upland, 34 acres more of intertidal habitat, and 82 acres more of subtidal habitat. The long-term effects of the changes in vegetation under the Riparian Alternative would be slightly less than from the Estuarine Alternative because the riparian vegetation in the PGC Delta would be left in place and would continue to mature. *Mitigation*: No mitigation has been identified for	*Impact 4.12.1: Alteration of Terrain and Water (SU)* During and after project construction, immediate impacts would include significantly altering the terrain of the lagoon by changing the lagoon shoreline at Pine Gulch Creek Delta and Dipsea Road and along Highway 1; immediate impacts would also include changes in water flow, volume, location, and possibly color all through the lagoon. *Mitigation*: No mitigation has been identified for this impact. *Impact 4.12.2: Short-Term Changes in Vegetation (SU)* This impact is roughly identical to the impact described for the Riparian Alternative. The Estuarine Alternative would remove over 100 acres of upland habitat, including all the vegetation on Kent Island, but would remove the mature trees in the PGC Delta. This would significantly change the view from the eastern and northern shores of the lagoon, as well as from viewing locations along Highway 1 and along the hiking trails on Bolinas Ridge. The impact would be slightly greater than that under the Riparian Alternative because the mature trees in the PGC Delta would be removed. *Mitigation*: No mitigation has been identified for this impact. *Impact 4.12.3: Long-Term Changes in Vegetation (SU)* Compared to the No Action Alternative in 2058, the Estuarine Alternative in 2058 would result in there being 100 fewer acres of upland, 34 acres more of intertidal habitat, and 82 acres more of subtidal habitat. The long-term effects of the changes in vegetation under the Estuarine Alternative would be slightly greater than from the Riparian Alternative because the riparian vegetation in the PGC Delta would be left in place and would continue to mature. *Mitigation*: No mitigation has been identified for

Table 2-7
Summary of Potential Significant Impacts *(continued)*

Resource Category	No Action/No Project	Riparian Alternative	Estuarine Alternative
		this impact.	this impact.
		Impact 4.12.4: Light and Glare (SM) Because lagoon sediment is scheduled to be excavated around the clock, the dredge would require night-time lighting. The project area has very little artificial light, and thus the light or glare may constitute a significant impact. *Mitigation 4.12.4:* This impact would be mitigated by the use of shielding, which would direct the light downward to the work area. Implementing this measure should reduce light and glare impacts to a less than significant level.	*Impact 4.12.4: Light and Glare (SM)* Because lagoon sediment is scheduled to be excavated around the clock, the dredge would require night-time lighting. The project area has very little artificial light, and thus the light or glare may constitute a significant impact. *Mitigation 4.12.4:* This impact would be mitigated by the use of shielding, which would direct the light downward to the work area. Implementing this measure should reduce light and glare impacts to a less than significant level.
		Impact 4.12.5: Changes to Existing Visual Quality of Water (SM) The excavation in the lagoon would be likely to produce turbid water in the area of excavation and around the disposal scow in Bolinas Bay. *Mitigation 4.12.5:* This impact would be mitigated by the use of a hydraulic suction dredge and siltation screens at the dredging site and dredge scow. Implementing this measure would reduce visual quality impacts to a less than significant level.	*Impact 4.12.5: Changes to Existing Visual Quality of Water (SM)* The excavation in the lagoon would be likely to produce turbid water in the area of excavation and around the disposal scow in Bolinas Bay. *Mitigation 4.12.5:* This impact would be mitigated by the use of a hydraulic suction dredge and siltation screens at the dredging site and dredge scow. Implementing this measure would reduce visual quality impacts to a less than significant level.
		Impact 4.12.6: Changes in Terrain (SM) As discussed in Section 4.4, potential significant impacts on the lagoon include erosion of the bluffs on the west bank of the inlet channel as a result of increased tidal prism and increased water velocity through the inlet. Additionally, increased velocity of water through the lagoon inlet could have a detrimental effect on Bolinas Beach and Stinson Beach on either side of the inlet. Such changes would constitute a substantial and permanent change to existing terrain. *Mitigation 4.12.6:* As discussed in Section 4.4, the impact on the bluffs would be mitigated by placing protection structures at the base of the bluff. The rate of erosion would be monitored to determine whether mitigation is warranted.	*Impact 4.12.6: Changes in Terrain (SM)* As discussed in Section 4.4, potential significant impacts on the lagoon include erosion of the bluffs on the west bank of the inlet channel as a result of increased tidal prism and increased water velocity through the inlet. Additionally, increased velocity of water through the lagoon inlet could have a detrimental effect on Bolinas Beach and Stinson Beach on either side of the inlet. Such changes would constitute a substantial and permanent change to existing terrain. *Mitigation 4.12.6:* As discussed in Section 4.4, the impact on the bluffs would be mitigated by placing protection structures at the base of the bluff. The rate of erosion would be monitored to determine whether mitigation is warranted.

Table 2-7
Summary of Potential Significant Impacts *(continued)*

Resource Category	No Action/No Project	Riparian Alternative	Estuarine Alternative
		Impacts to the beaches could be mitigated by replacing any lost sand.	Impacts to the beaches could be mitigated by replacing any lost sand.

Key: SU = Significant and unmitigable
SM = Significant but mitigated to less than significant

Table 2-8
Consistency with Federal and State Laws

Law	Summary	Consistency
Archaeological and Historic Preservation Act of 1974. 16 U.S.C. § 469	This act requires federal agencies to preserve archeological and historical data and artifacts threatened by dam construction or other federally-licensed projects.	If archaeological materials are discovered during construction appropriate actions would be taken in compliance with the AHPA and NHPA.
Archaeological Resources Protection Act of 1979, 16 U.S.C §§ 470aa – 470mm.	Among other things, requires all excavations on federal land to be undertaken pursuant to permit issued by the federal land manager. Imposes criminal penalties for unauthorized excavations.	This act is not applicable at this time as no archaeological excavations are expected to be undertaken.
Clean Air Act, 42 U.S.C. § 7401 – 7671q, and implementing regulations (40 CFR 51.850)	Among other provisions, the Clean Air Act (CAA) requires federal agencies to ensure that their actions conform to EPA- approved State Implementation Plans (SIP) governing air quality.	Technical Appendix D provides draft conformity statements based on the air quality analysis conducted for the project.
Clean Water Act, 33 U.S.C. § 1251 et seq., and implementing regulations (33 CFR 320-330, 335-338, 40 CFR 104-140, 230-233, 401-471)	The Clean Water Act prohibits the discharge of pollutants into the navigable waters of the United States without prior approval by the EPA or authorized state agency. Section 404 of the Clean Water Act grants the U.S. Army Corps of Engineers (the Corps) the authority to approve the placement of dredged or fill material into the navigable waters of the U.S.	During feasibility planning, the Corps shall conduct - to the fullest extent practicable - the investigation and analysis required by the CWA guidelines. The 404(b)(1) analysis shall be included in the Feasibility Study.
Coastal Zone Management Act, 16 U.S.C. §§ 1451 – 1465, and implementing regulations (15 CFR 921-933)	Federal actions that impact the coastal zone must be as consistent as reasonably possible with state coastal zone management policies and programs.	A Coastal Consistency Determination will be prepared by the lead agencies following certification of the EIS/EIR.
Endangered Species Act, 16 U.S.C. §§ 1531 – 1544, and implementing regulations (50 CFR 17, 401-424, 450-453	The Endangered Species Act (ESA) protects plants and animals listed as endangered or threatened. Federal agencies are prohibited from taking action that might adversely effect listed species or critical habitat, and requires federal agencies to consult with the Fish and Wildlife Service to determine whether proposed actions might endanger such species or habitat.	The lead agencies have initiated consultation with the Fish and Wildlife Service and National Marine Fisheries Service to determine possible impacts on sensitive species and identify appropriate mitigation for such impacts.
Estuary Protection Act and implementing regulations, 16 U.S.C. §§ 1221 – 1226	Requires federal agencies to consider the impacts of their actions on estuaries and their natural resources, as well as commercial and industrial uses of the estuaries.	This EIS/EIR is designed to analyze the impact of the project on the Bolinas Lagoon, an estuarine lagoon.
Fish and Wildlife Coordination Act and implementing regulations, 16 U.S.C. §§ 661 – 666c	Any federal agency that proposes to control or modify any body of water must first consult with the USFWS or NMFS, as appropriate, and with the head of the appropriate state agency exercising administration over the wildlife resources of the affected state.	The lead agencies have initiated consultation with USFWS, NMFS, and CDFG regarding project impacts.

Table 2-8
Consistency with Federal and State Laws *(continued)*

Law	Summary	Consistency
Marine Mammal Protection Act, 16 U.S.C. §§ 1361 – 1421h, and implementing regulations	Prohibits the taking, harm, or harassment of marine mammals.	The lead agencies have designed the project to minimize impacts on marine mammals in Bolinas Lagoon.
Marine Protection, Research and Sanctuaries Act, 33 U.S.C. § 1401 et seq., 16 U.S.C. § 1431 et seq., as amended, and implementing regulations	Establishes the National Marine Sanctuaries. NOAA establishes regulations controlling sanctuaries.	The project is designed to be in compliance with the Sanctuary regulations and the GFNMS management plan.
Migratory Bird Treaty Act, 16 U.S.C. §§ 703 - 712, and implementing regulations	Prohibits injury or taking of birds covered by act without permission.	The project is designed to limit impact on birds.
National Environmental Policy Act, 42 USC § 4321 et seq., and implementing regulations (40 CFR 1500 et seq.)	The National Environmental Policy Act (NEPA) requires any agency undertaking a major federal action to ensure that the decision-making process considers the environmental impacts of the proposed action.	This EIS/EIR is designed to comply with NEPA and its implementing regulations.
National Historic Preservation Act, 16 USC §§ 470a et seq., and implementing regulations (36 CFR 800)	Section 106 of the NHPA requires federal agencies to take into account the effect their actions might have on historic properties, and offer the public, the State Historic Preservation Officer (SHPO), and the Advisory Council on Historic Preservation (ACHP) an opportunity to comment.	The lead agencies have initiated consultation with the SHPO and the ACHP to document compliance with the NHPA and its implementing regulations.
Rivers and Harbors Act, 33 U.S.C. § 403, and implementing regulations	This section grants the Corps of Engineers authority to regulate construction, excavation, or filling within the navigable waters of the United States.	The EIS/EIR documents the impact of the project on wetlands in Bolinas Lagoon, and sets forth proposed mitigation to limit the damage to wetlands.
Submerged Lands Act, 43 U.S.C. § 1301 et seq., as amended, and implementing regulations	This act affirms the states' ownership of the lands beneath the navigable waters of the United States, while retaining in the United States authority over navigation, flood control, and power production.	The lead agencies will consult with the California State Lands Commission to confirm compliance with state regulations.
NOAA Master Plan, Point Reyes-Farallon Islands National Marine Sanctuary, 15 CFR Part 922	Identifies the Sanctuary boundaries and prohibited actions within the Sanctuary, and establishes permit procedures.	The EIS/EIR documents the consistency of the project with the GFNMS regulations.
E.O. 11990 – Protection of Wetlands (42 Fed. Reg., May 25, 1977)	Requires agencies to minimize destruction of wetlands when managing lands, administering federal programs, or undertaking construction. Agencies are also required to consider effects of federal actions on the health and quality of wetlands.	The EIS/EIR documents the impact of the project on wetlands in Bolinas Lagoon, and sets forth proposed mitigation to limit the damage to wetlands.
E.O. 12898 – Environmental Justice (59 Fed. Reg. 7629, February 16, 1994)	This Order requires federal agencies to identify and avoid disproportionate impacts on minority or low-income communities.	Section 6 of the EIS/EIR documents the lead agencies' compliance with this order.
E.O. 13045 – Protection of Children from Environmental Health Risks and Safety Risks (62 Fed. Reg. 19885, April 23, 1997)	This Order requires federal agencies to identify, assess, and address disproportionate environmental health and safety risks to children from federal actions.	Section 6 of the EIS/EIR documents the lead agencies' compliance with this order.
California Coastal Act of 1976, Cal. Pub. Res. Code §§ 30000 et seq.	Requires coastal consistency determination from California Coastal Commission.	A Coastal Consistency Determination will be prepared by the lead agencies following certification of the EIS/EIR.
California Endangered Species Act, Cal. Fish and Game Code §§ 2090 et seq.	Requires consultation with CDFG regarding impacts to species identified as sensitive under the California ESA.	The lead agencies have initiated consultation with CDFG to determine possible impacts on sensitive species and identify appropriate mitigation for such impacts.
Magnuson-Stevens Fishery Management Act, 16 U.S.C. § 1801 et seq.	Federal agencies must consult with NMFS on proposed actions that may adversely affect Essential Fish Habitat as defined under the Act.	The lead agencies have initiated consultation with USFWS, NMFS, and CDFG regarding project impacts.